



# ADCPs in Hydrologic Extremes

---

Smart solutions for  
water quality & flow

May 20, 2026



# Introduction



2020 Flooding in the UK

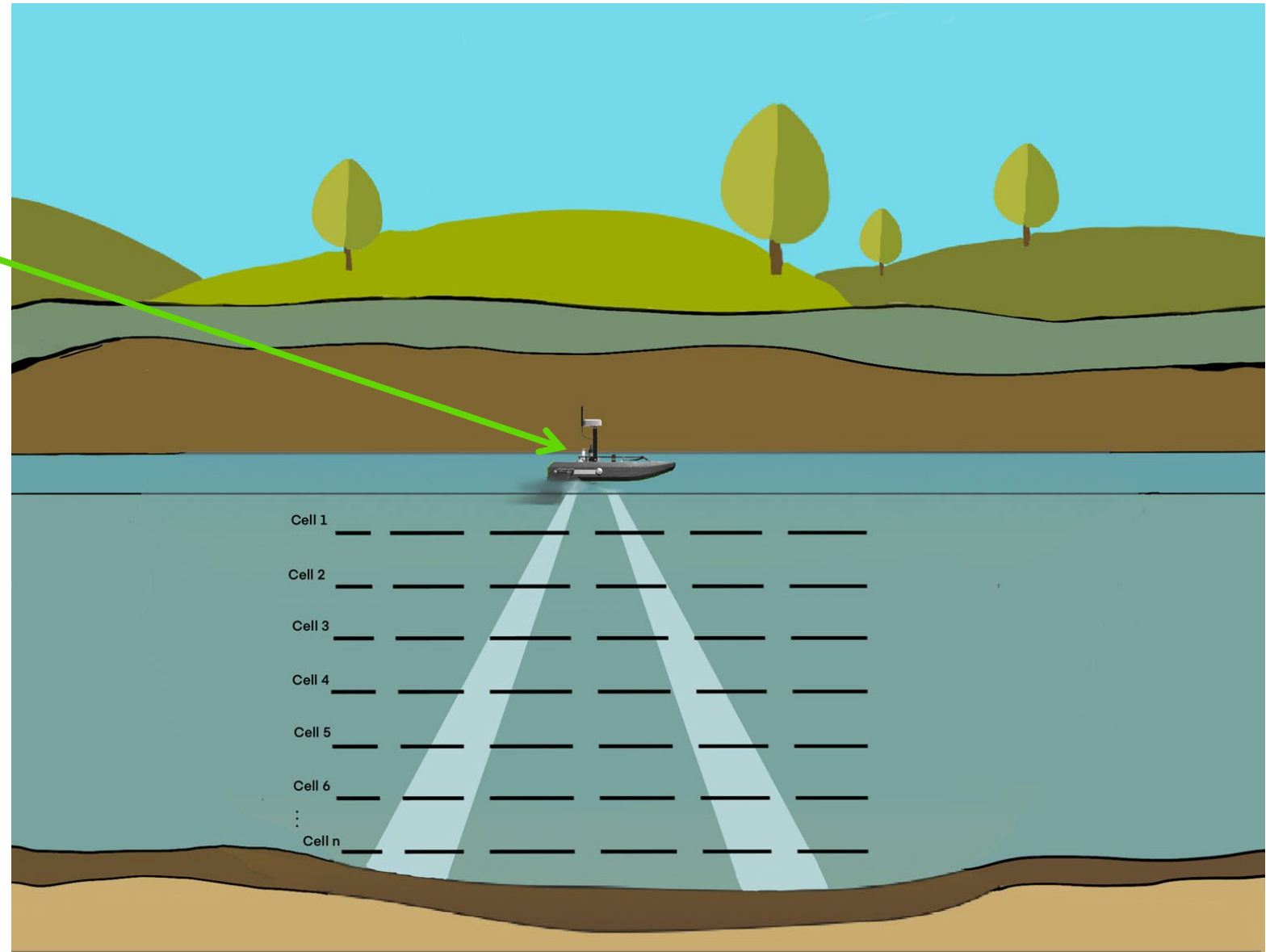
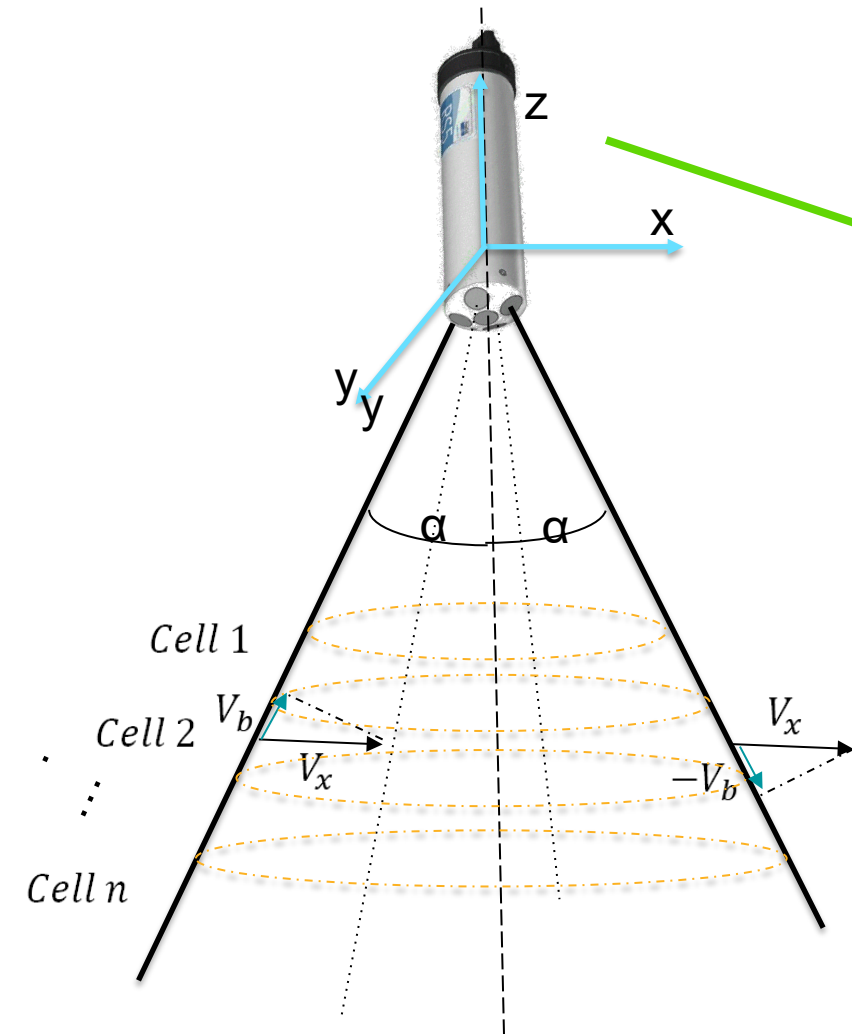


Lake Mead at the Hoover Dam

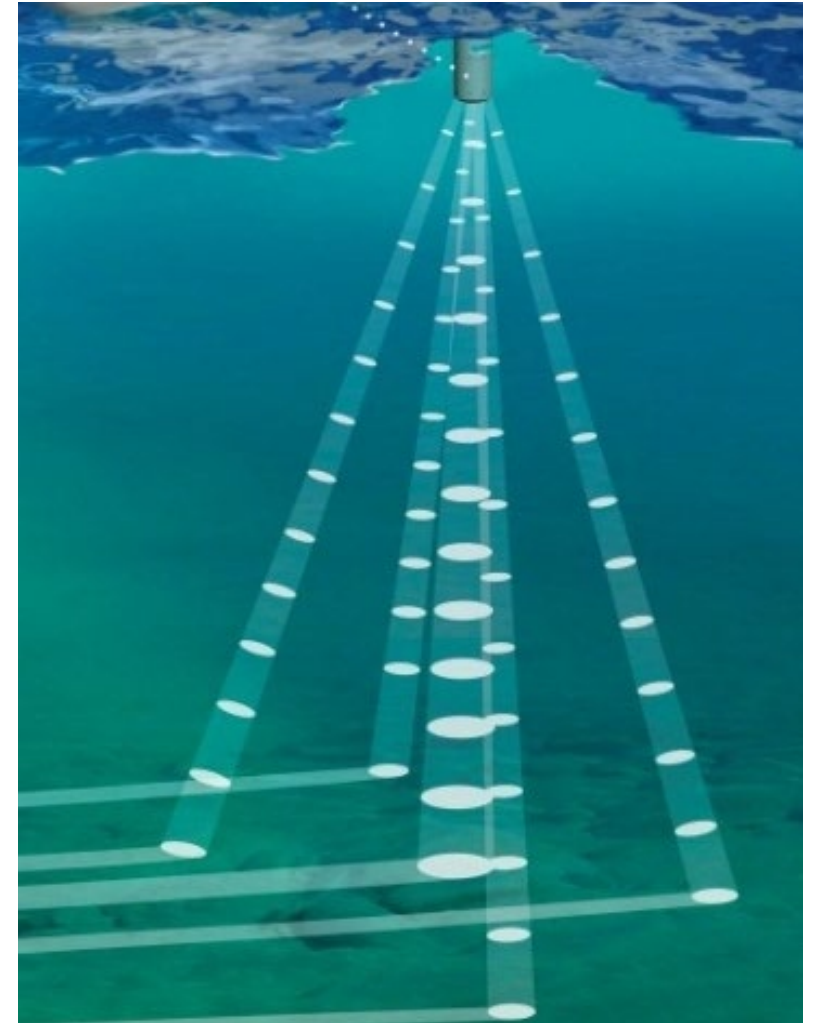
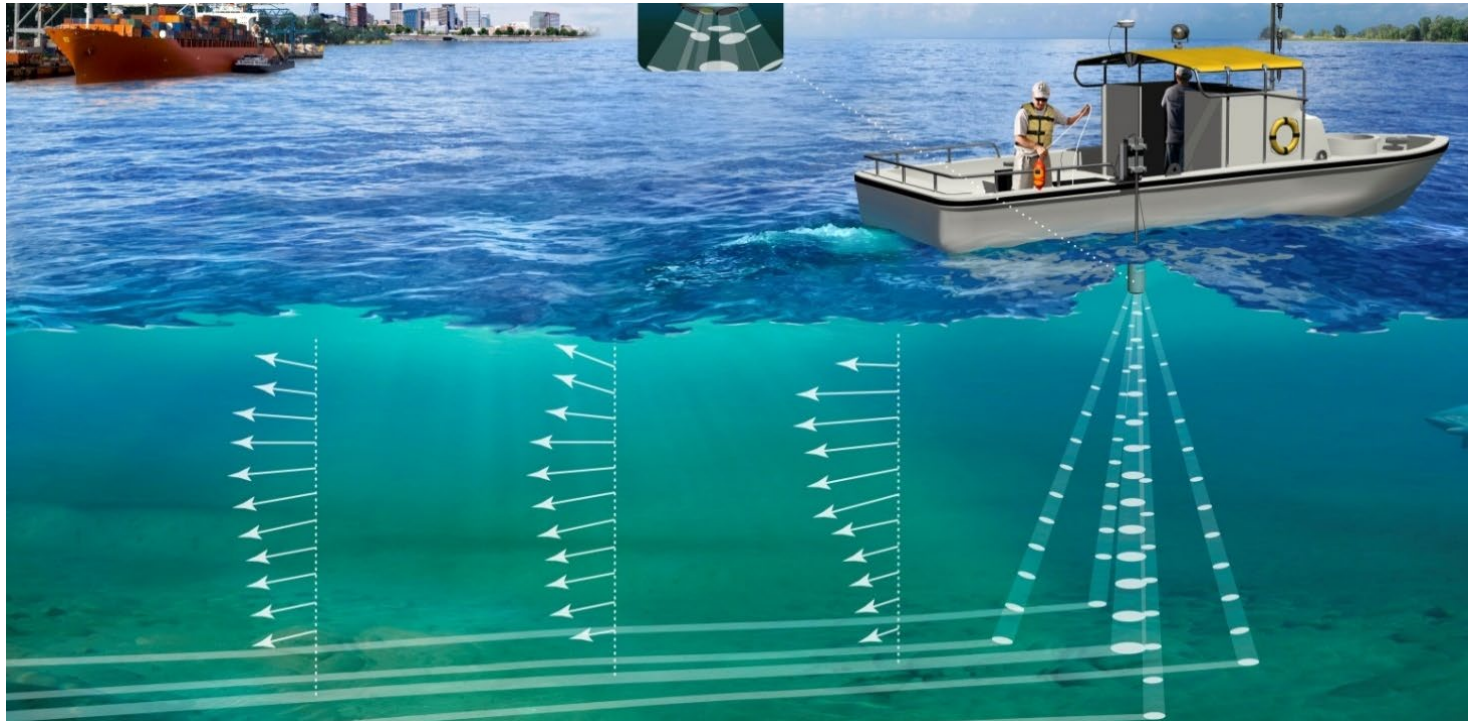
---

Smart solutions for  
water quality & flow

# What is an Acoustic Doppler Current Profiler (ADCP)?



# What is an ADCP?



# Application Examples

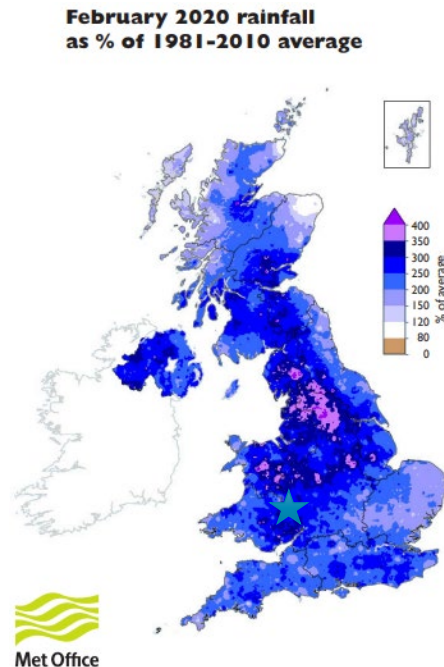


# Widespread Flooding in the UK 2020



# February 2020 – a “remarkable” month (in hydrological terms)

- 4th wettest month on record (since 1910)
- 3 different storms  
(‘Ciara’, ‘Dennis’, and ‘George’)
- Greatest rainfall anomalies (350% over average) in northern/central England



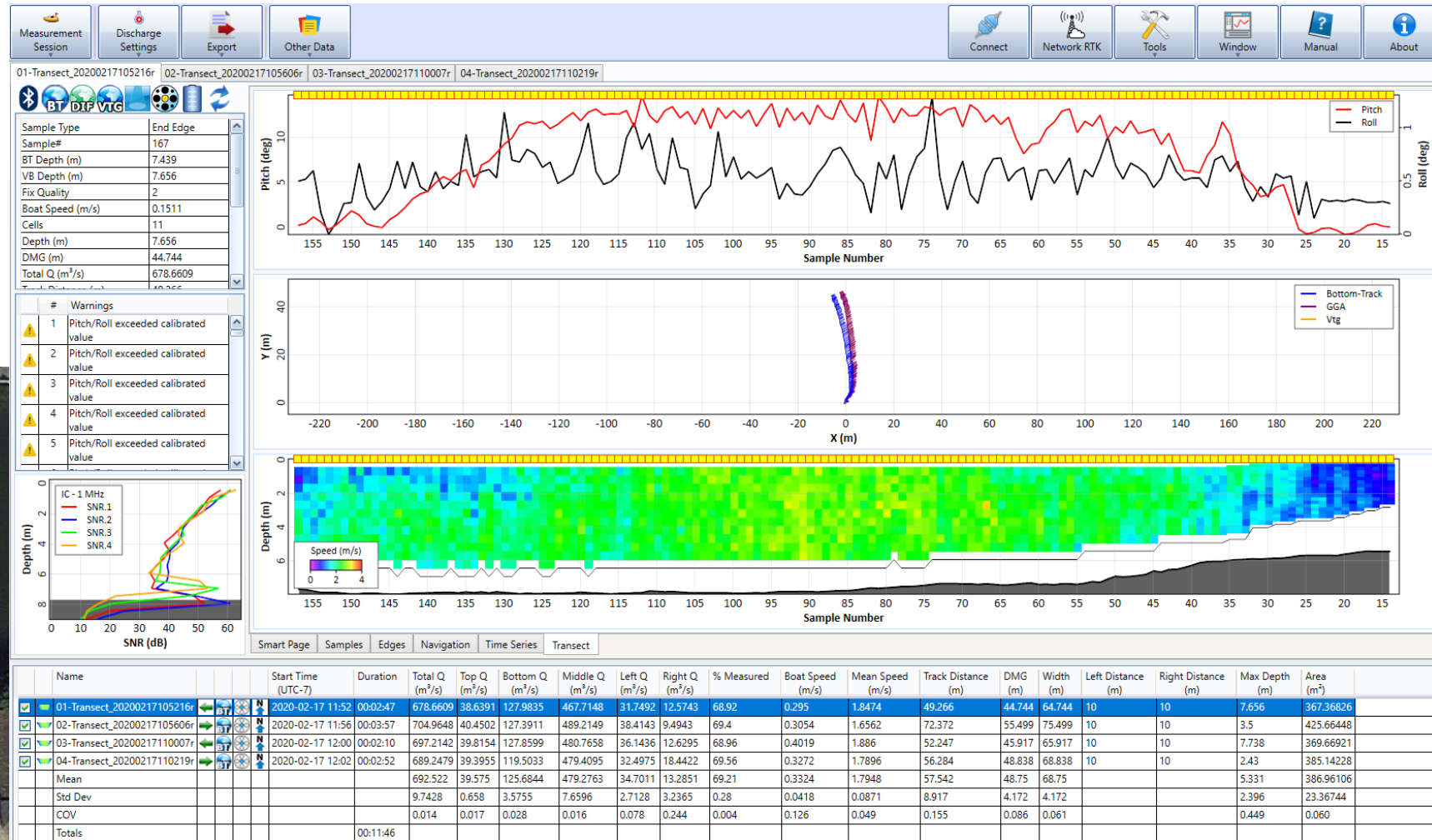
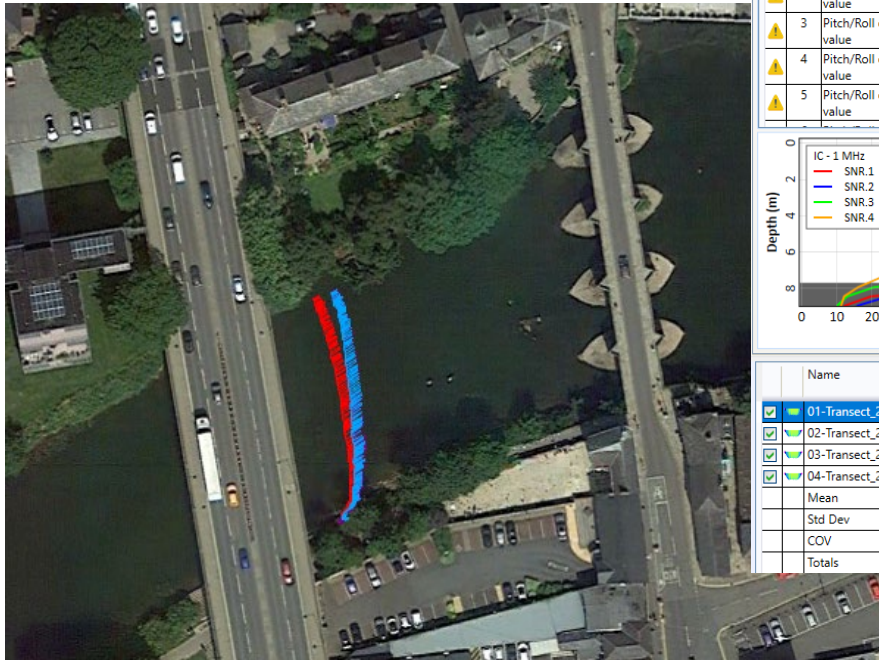
# Measuring in Flood Conditions: River Severn: Belmont

(Data courtesy of Rob Davies)



# Measuring in Flood Conditions: River Severn

Measured Q = 24,453.3 ft<sup>3</sup>/s  
Max speeds = 11.5 ft/s

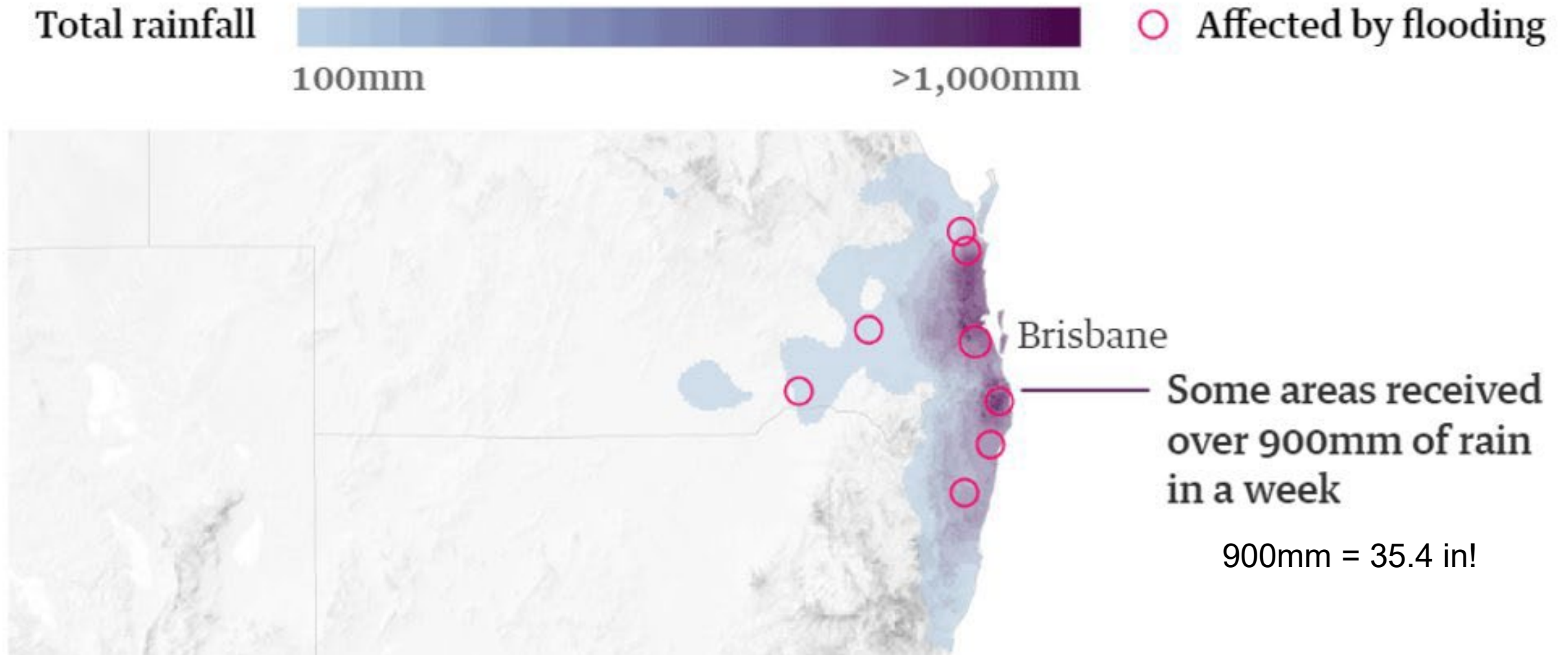


xylem

# 2022 Eastern Australia Flooding

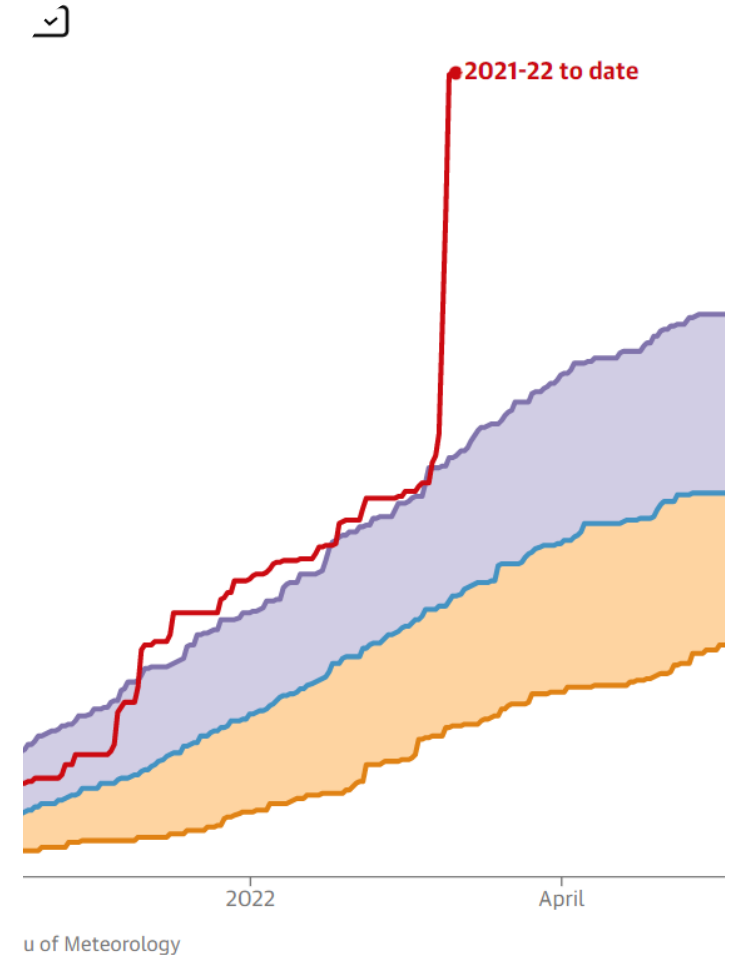


# 2022 Eastern Australia Flooding



# 2022 Eastern Australia Flooding

- 26in rain in 3 days in late February.
- Brisbane's wettest three days on record
- Largest 3 and 7 day total ever recorded in Brisbane topping 1974 records
- Damage from floods is expected to reach almost \$1.5 billion



# Impact - Brisbane

- 20,000 homes inundated
- 51,000 without power
- Wivenhoe Dam peaked at 183.9%
  - Inflows of 2.2 million Megaliters
  - Released 150,000 Megaliters

Prof Stuart Khan, an expert on water management at the University of New South Wales, says Wivenhoe gained about 1,450 billion litres of water, “which all came in under three days”. That is about three Sydney Harbours’ worth of water.

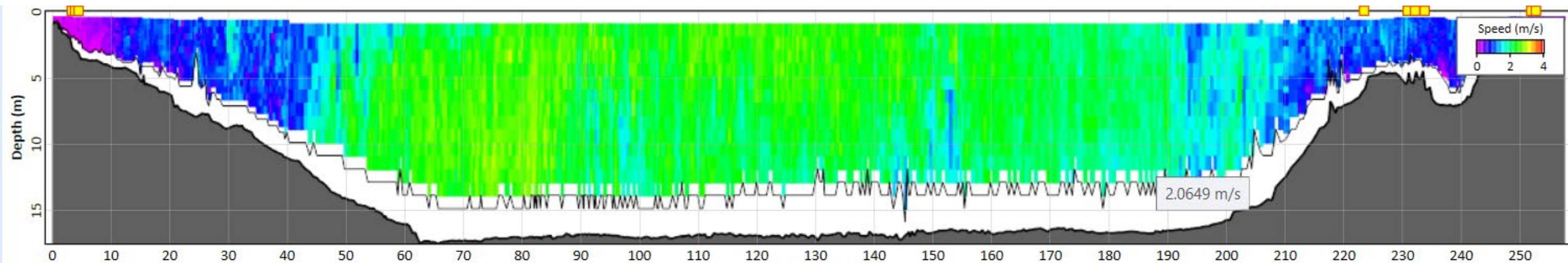
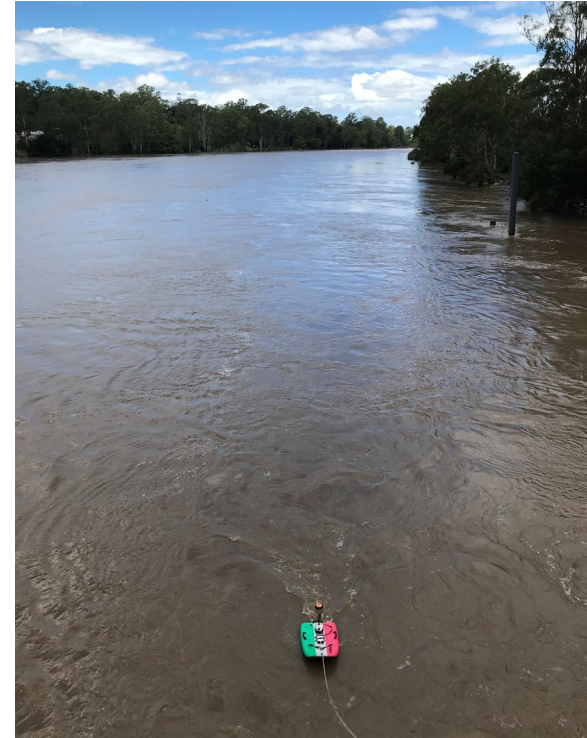


# Brisbane flooding



# ADCP – Brisbane River Gauging

- Water level: 26 ft
- Mean velocity: 6.6 ft/s
- Max velocity: 10.9 ft/s
- Discharge: 197,479.6 ft<sup>3</sup>/s



xylem

# Santa Ana River below Prado Dam




























# Prado Base Flow



# Prado Base Flow

Max depth = 1.14 ft

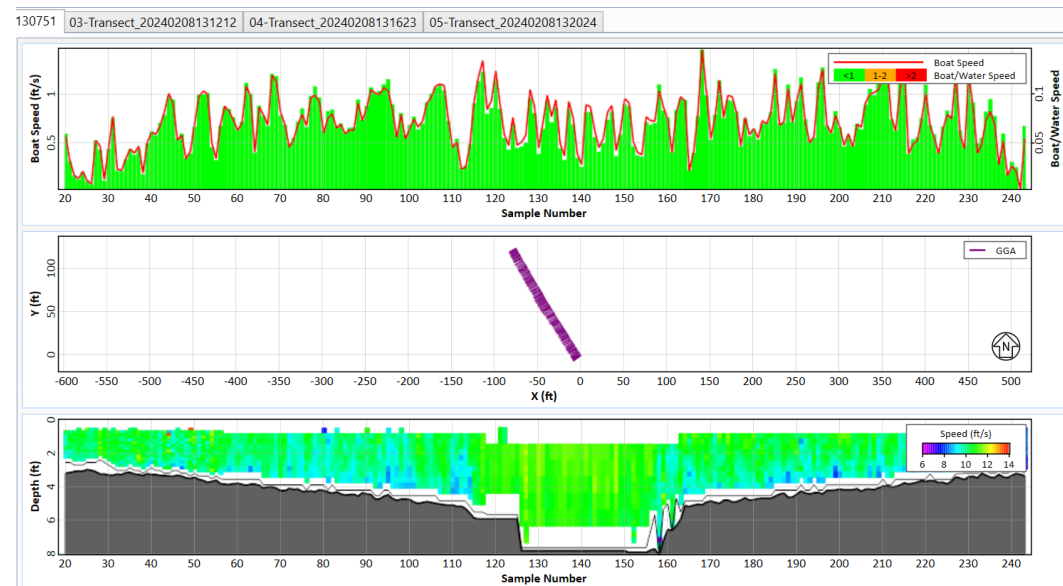
		Name					Start Time (UTC-7)	Duration	Total Q (ft <sup>3</sup> /s)
		01-Loop_20220621104446					2022-06-21 10:45	00:03:09	-0.2483
<input checked="" type="checkbox"/>		02-Transect_20220621104821					2022-06-21 10:48	00:02:33	66.6085
<input checked="" type="checkbox"/>		03-Transect_20220621105106					2022-06-21 10:51	00:01:54	67.1086
<input checked="" type="checkbox"/>		04-Transect_20220621105309					2022-06-21 10:53	00:02:15	66.2353
<input checked="" type="checkbox"/>		05-Transect_20220621105534					2022-06-21 10:55	00:01:58	66.122
		Mean							66.5186
		Std Dev							0.3853
		COV							0.006

# Prado: High Flow Check measurement



Highest flow on record with current channel configuration

- RS5: 7,324 ft<sup>3</sup>/s
- Max depth = 8.2 ft
- Mean V = 8.9 ft/s



# Extreme discharge measurement with SonTek-M9



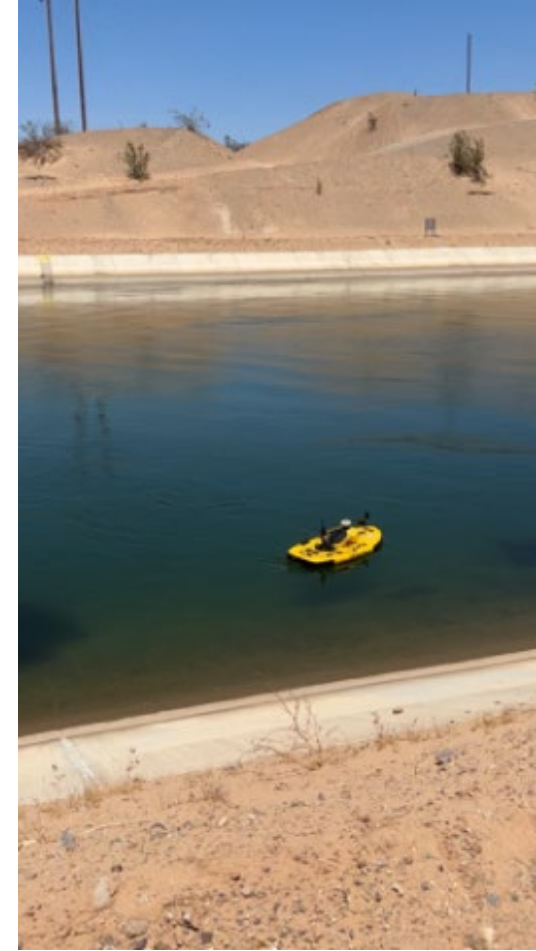
“If you feel the bridge start to move, drop the ADCP rope and run.”

Steve Gustafson  
WEST Consultants  
(former USGS)



# Surfbee gauging on the All American Canal – Southwestern US

- Autonomous measurements, even between bridges!
- Traditionally setting up a line across the canal would take several hours
- 6 Measurements in 4 separate locations in under 2 hours
- USGS study to determine water loss to unlined section of the canal.



# Surfbee Gauging on the All American Canal – Southwestern US

Google earth transect

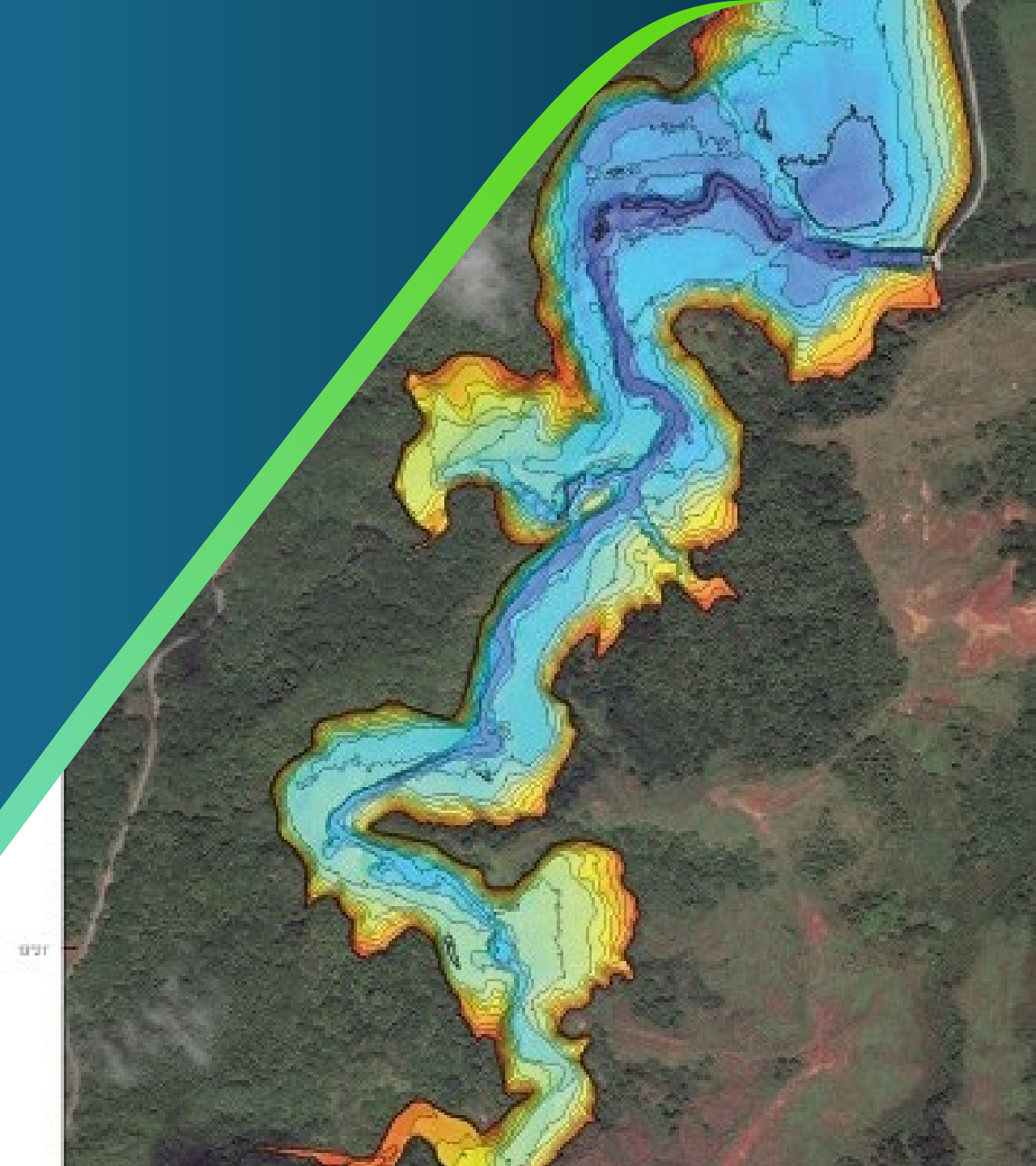


# Surfbee Gauging on the All American Canal – Southwestern US

	Mean V (ft/s)	Depth (ft)	Avg Q (ft <sup>3</sup> /s)
Upstream	1.97	15	4,723
Downstream	2.03	15	4,176
Difference			<b>547</b>

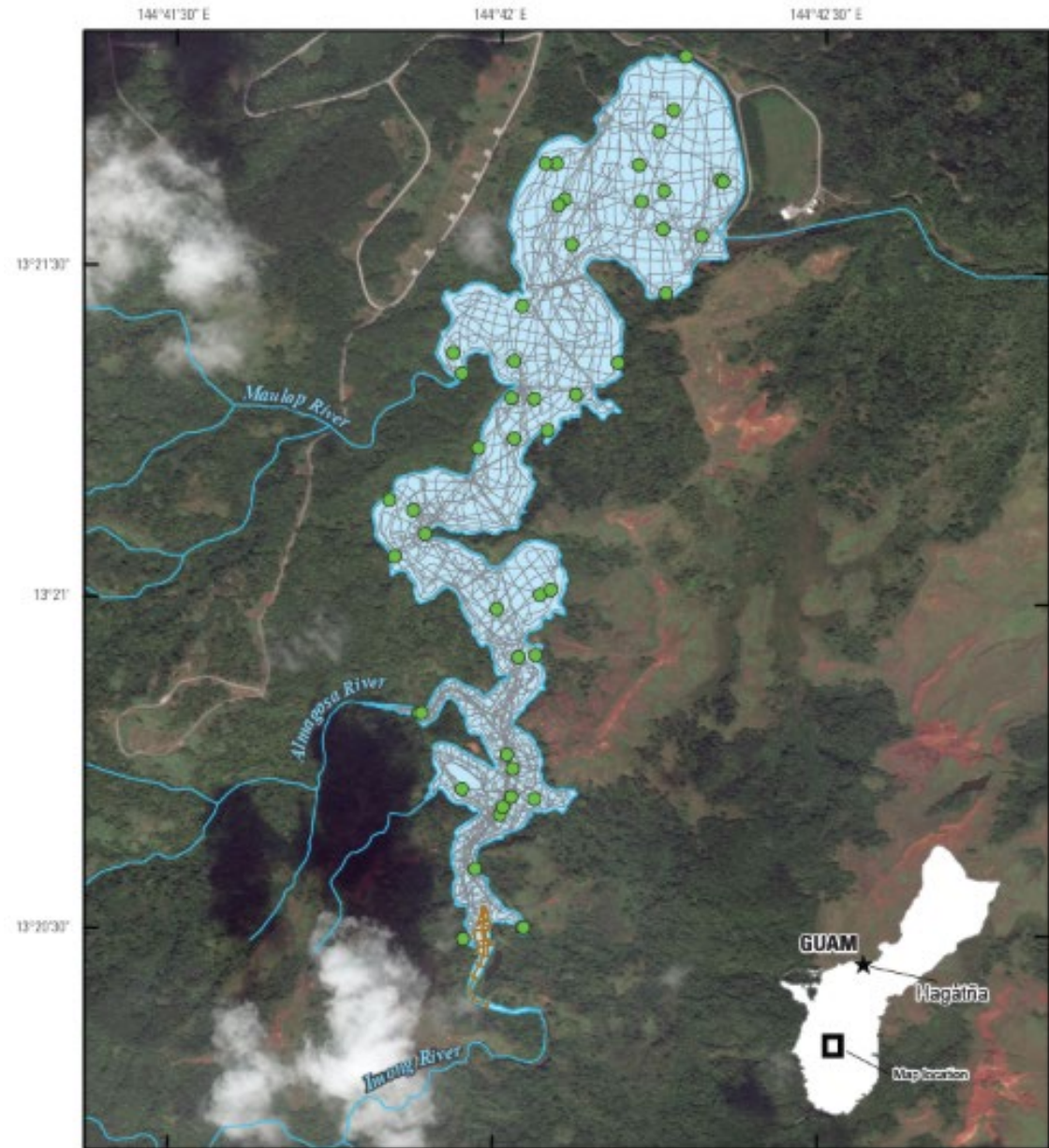
xylem

Reservoir  
Capacity: Fena  
Valley Reservoir  
Guam



# M9 Bathymetric Survey

- Primary source of water for US Naval base and nearby villages
- Sediment accumulation has reduced storage
- Surveyed in 1973, 1979, 1990
- Current storage from a recent M9 bathy survey
- 43% storage decrease since construction in 1951

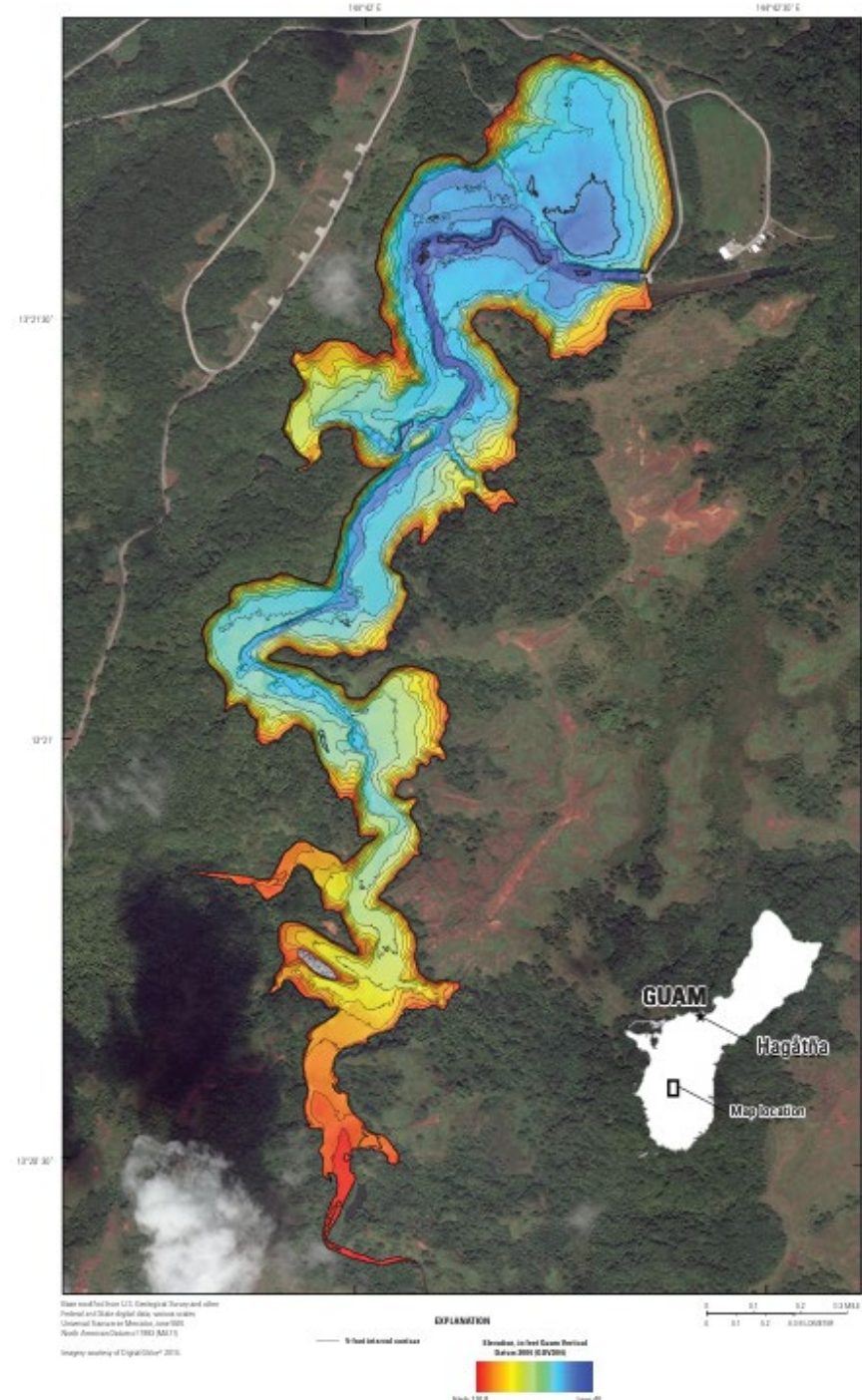
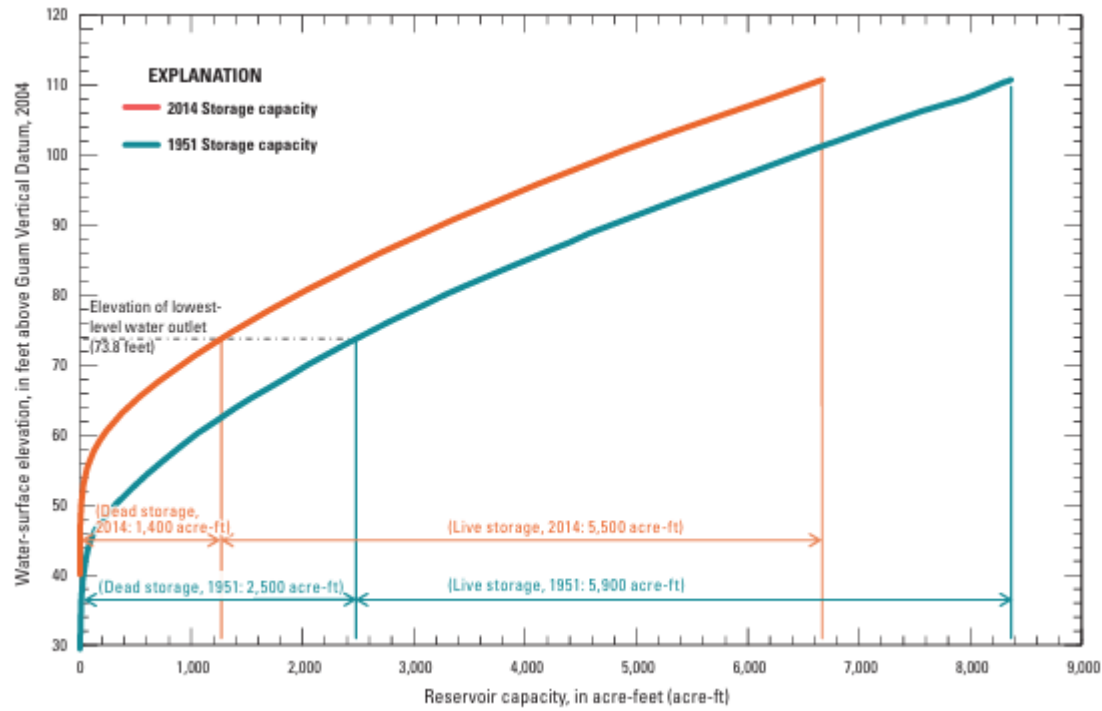


Base modified from U.S. Geological Survey and other Federal and State digital data, various scales. Imagery courtesy of DigitalGlobe. ©2014 Universal Transverse Mercator, zone 50N North American Datum of 1983 (NAD83)

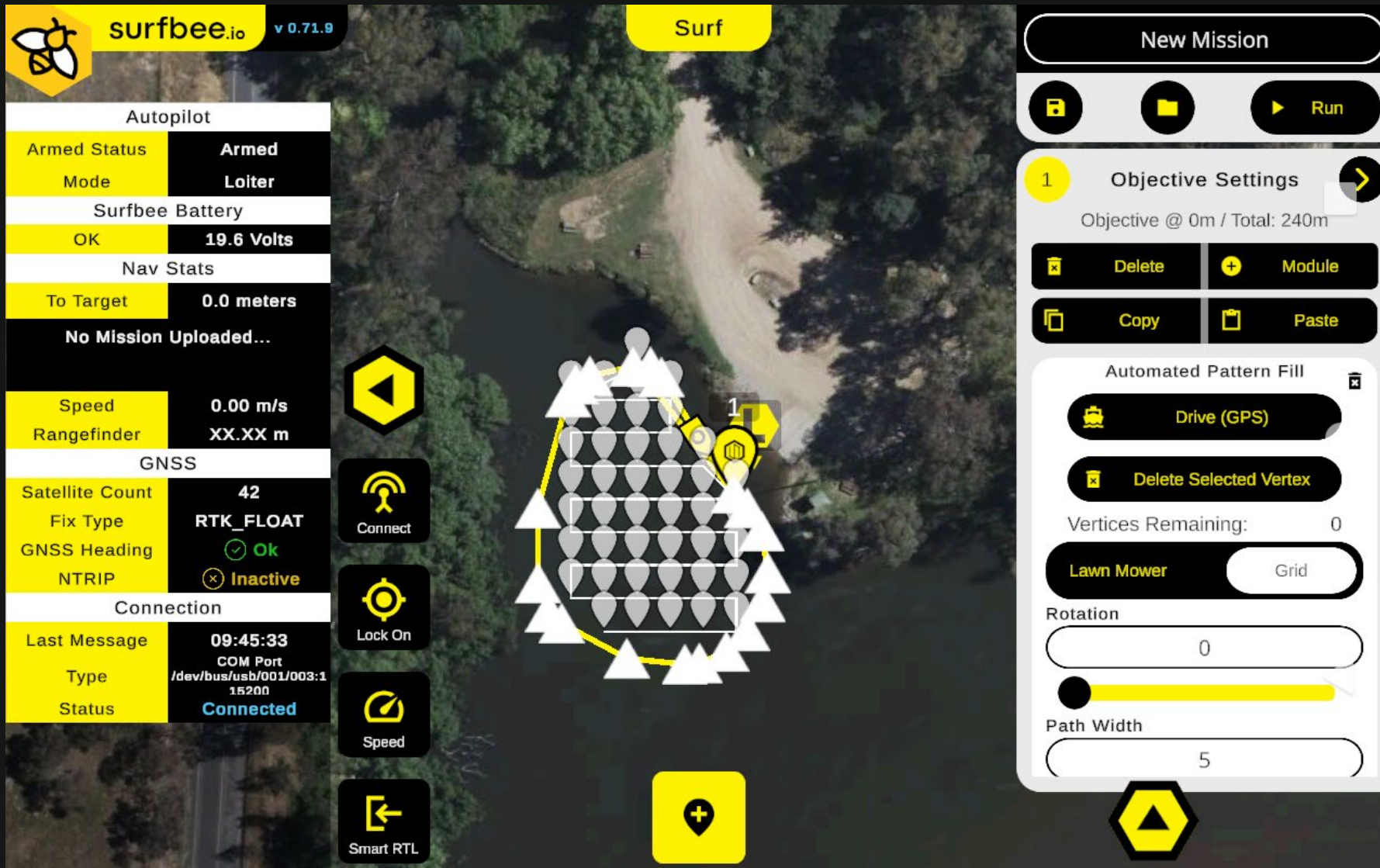
#### EXPLANATION

- CTD profile locations
- Reservoir shoreline
- Rivers
- Topographic survey path
- Boat track

# M9 Bathymetric Survey



# Surfbee App



**surfbee.io v 0.71.9** Surf

Autopilot	
Armed Status	Armed
Mode	Loiter

Surfbee Battery	
OK	19.6 Volts

Nav Stats	
To Target	0.0 meters

No Mission Uploaded...

Speed	0.00 m/s
Rangefinder	XX.XX m

GNSS	
Satellite Count	42
Fix Type	RTK_FLOAT
GNSS Heading	OK
NTRIP	Inactive

Connection	
Last Message	09:45:33
Type	COM Port /dev/bus/usb/001/003:1
Status	Connected

Speed

Smart RTL

**New Mission**

Run

1 Objective Settings

Objective @ 0m / Total: 240m

Delete Module

Copy Paste

Automated Pattern Fill

Drive (GPS)

Delete Selected Vertex

Vertices Remaining: 0

Lawn Mower Grid

Rotation 0

Path Width 5

## Features

- Easy to use interface
- ADCP mission Planning
- Bathymetry mission Planning
- WQ mission Planning
- RTK Correction Streaming
- Vessel Diagnostics and management
- Android and Window Version
- Hypack Waypoint mission Import
- Camera Integration (Coming Soon)

## Featured instruments



### **RiverSurveyor RS5**

It is the smallest and lightest complete ADCP solution for moving boat discharge measurement available. It's measurement depth range is from 1/3 ft to 20 ft.



### **RiverSurveyor M9**

Multi-frequency ADCP that measures from shallow to deep. Automatically adjusts the frequency and pulse type using SmartPulseHD®. Fully Integrated with HYPACK MAX and Environmental for bathymetric Surveying. It's measurement range is from 1.5 ft to 130 ft.



### **Surfbee**

Fully autonomous ASV designed specifically for discharge measurements and bathymetric Surveying with ADCPs. Includes GNSS heading and powered by DeWalt tool batteries

# Thank You

---

Smart solutions for  
water quality & flow

Questions?  
[info@ysi.com](mailto:info@ysi.com)

Kevin Labbe  
Senior Applications Engineer  
[Kevin.Labbe@xylem.com](mailto:Kevin.Labbe@xylem.com)